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DEPARTMENT: AGRICULTURAL SCIENCE

MAT104 ASSIGNMENT

1. $e^x \sin x dx$

$u = \sin x$

$\frac{du}{dx} = \cos x$

$\frac{dy}{dx} = e^x$

$dy = e^x dx$

$\therefore \int e^x \sin x dx$

$= e^x \sin x - \int e^x \cos x dx$

$= e^x \sin x - e^x \cos x + \int e^x \sin x dx$

$= \frac{e^x (\sin x - \cos x)}{2} + C$

2. $2x^2 \ln x dx$

Solution

Let $u = \ln x$

$\frac{du}{dx} = \frac{1}{x}$

$\frac{dy}{dx} = 2x^2$

$y = \frac{2x^3}{3}$

$\therefore \int 2x^2 \ln x dx$

$= \ln x + \frac{2x^3}{3} - \int \frac{2x^3}{3} \times \frac{1}{x}$

$= \frac{2x^3}{3} \ln x - \frac{2}{3} \int x^2 dx$

$= \frac{2x^3}{3} \ln x - \frac{2}{3} \left(\frac{x^3}{3} \right) + C$

$= \frac{2x^3}{3} \ln x - \frac{2}{9} x^3 + C$

$$3. \int x^2 \sin x \, dx$$

Solution

$$u = x^2 \quad \frac{du}{dx} = 2x$$

$$\frac{du}{dx} = 2x$$

$$v = -\cos x$$

$$\therefore \int x^2 \sin x \, dx$$

$$= x^2(-\cos x) - \int 2x(-\cos x) \, dx$$

$$= -x^2 \cos x + 2 \int x \cos x \, dx$$

Recall $\int x \cos x \, dx = x \sin x + \cos x$

$$\therefore \int x^2 \sin x \, dx$$

$$= -x^2 \cos x + 2(x \sin x + \cos x) + C$$

$$= \underline{\underline{(2 - x^2) \cos x + 2x \sin x + C}}$$

$$4. \int x \cos x \, dx$$

Solution

$$u = x \quad \frac{du}{dx} = 1$$

$$\frac{du}{dx} = 1$$

$$v = \sin x$$

$$\therefore \int x \cos x \, dx$$

$$= x \sin x - \int 1 \times \sin x \, dx$$

$$= x \sin x - \int \sin x \, dx$$

$$= \underline{\underline{x \sin x + \cos x + C}}$$